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Science 173 (Jul 9 1971) 104-105.

Restoring Bacterial Toxigenicity

The report by M. W. Eklund *et al.* (30 Apr., p. 480) on the restoration of toxigenicity by phage infection to nontoxic strains of *Clostridium botulinum* brings to mind a paper published 78 years ago on a closely related subject. Francesco Sanfelice's name is best known for his isolation of the pathogenic fungus *Cryptococcus neoformans;* however, in 1893 (*1*) he reported studies on anaerobic bacteria, including *Clostridium tetani* and related organisms that he regarded as indistinguishable except for their having lost the ability to produce toxin. In support of this evolutionary view, he studied the effect of culturing the nontoxic strains in sterile filtrates of the toxic bacteria. His crude assay methods were far from compelling, but they did indeed point to a toxic conversion quite analogous to that described in the recent report. Neither bacteriophages, nor their fascinating attributes of transduction or lysogenic conversion had yet been discovered; nor had toxins been purified. He may be forgiven for the naive speculation that the toxin itself was the active agent.

As far as I am aware, Sanfelice's experiment was never subjected to further verification, and it thus played no part in the further history of bacterial genetics. However, it was conceptually similar to the pneumococcus transformation, reported by Griffith 35 years later (a latent period familiar to geneticists). It is now a reasonable surmise that his observations were correct.

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Reference

1. F. Sanfelice, *Z. Hyg. Infektionskr.* **14**, 339 (1893).